Silvicultural Research Conference
USDA Forest Service Southern
Research Station GTR-SRS-XXX

# A QUANTITATIVE ASSESSMENT OF THE STRUCTURE AND FUNCTIONS OF A MATURE BOTTOMLAND HARDWOOD COMMUNITY: THE IATT CREEK ECOSYSTEM SITE

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**Abstract**--We report our efforts, initiated in 1995, to quantify ecological processes and functions in a relatively undisturbed, mature hardwood forest. The 320 ha site is located in central LA on the upper reaches of Iatt Creek, an anastomosing minor stream bottom. The forest is a mature sweetgum (*Liquidambar styraciflua* L.) cherrybark oak (*Quercus pagoda* Raf.) dominated community with over 70 woody plant species present. Soils are Typic Glossaqualfs. Flooding is flashy and primarily in the dormant season. Initial analyses indicate major overstory species groups do respond to elevational differences within the bottom. Fine litterfall transfers average 8520 kg $ha^{-1}$ $yr^{-1}$ with 63 percent as leaf fall. Aboveground NPP averages 14200 kg $ha^{-1}$ $yr^{-1}$. Leaf litter decomposition, as measured by mass loss, was initially greater in the bottomland, but in the second year there was little difference between sites. Pure sweetgum and red oak (*Erythrobalanus*) decomposed significantly faster than pine needles in both environments. In the pine site sweetgum mass loss was initially more rapid than red oak. A diverse avian and aquatic population is evident.

## INTRODUCTION

There are an estimated 12.5 million ha of forest wetlands in the Southern United States, less than half their original area. Their decline, growing awareness of their importance, and efforts to replant or restore bottomland forests have increased pressure to understand the structure and functions unique to these communities.

In 1995, the Wetland Hardwood Forest Ecosystem Research and Management Project was initiated. This long term study is a joint effort of Center for Bottomland Hardwoods Research, Stoneville, MS and the Center for Forested Wetlands, Charleston, SC; both units are in the Southern Research Station, USDA-FS,

In managing, maintaining or restoring ecosystems the initial need is to identify important functions that characterize undisturbed or stable communities or landscapes. Therefore the consortium's initial objective has been to quantify the physical, chemical, and biological functions of mature bottomland forest communities (Harms and Stanturf 1994).

To address this objective two research areas have been established. One is on a major alluvial bottom of the Coosawhatchie River, SC and the other is on a minor alluvial bottom, upper Iatt Creek, central Louisiana. The site types have been chosen based on their extent across the South and their probable exposure to management treatments. Selection of specific study areas has been based on condition, age, and stability of communities and the area's size and hydrology. Heavily harvested forest communities and dam controlled streams have been avoided. Study areas have at least 300 Ha; and non-research management activities are to be minimal for at least the next 10 years. Each Center has assumed primary responsibility for the site closest to them.

A minor alluvial bottom has been selected because the majority of the bottomland hardwood forests remaining in the south are within minor alluvial bottoms (Hodges 1998). Moreover, it is these bottoms that are expected to face some of the highest management pressures. Minor alluvial bottoms differ from those of major streams primarily in flood characteristics (e.g. frequent with short duration) and the greater influence of surrounding uplands due to the bottom's relatively narrow width and local sources of alluvium.

The objective of this paper is to describe the Iatt Creek Study Area, and to present some of the preliminary results of this study.

**THE IATT CREEK SITE**

The Iatt Creek research site is on the upper reaches of Iatt creek in Central LA (31°43'30" N; 92° 38' W,) the Kisatchie National Forest, Winn District. The site is a braided stream bottom dominated by Iatt creek but laced with secondary streams flowing into and parallel with the primary stream. The ≈ 195 $km^2$ watershed upstream from the research site, is primarily forest and pasture. The ≈ 345 ha research area varies in width from 550 to 1000 m with an overall length of 5000 m. The dominant soil series is Guyton, Typic Glossaqualfs. Climate is in the humid temperate domain, subtropical division (Bailey 1998) with a normal annual temperature of 18.1° C and normal annual precipitation of 1470 mm (Owenby and Ezell 1992).

**Studies**

Based on published research, there are evident gaps in our understanding of the basic processes and components within bottomland forests. These gaps are especially evident for minor bottoms. On the Iatt Creek study area 11 studies are currently ongoing. This report will focus on initial analysis of the vegetative community, aboveground net primary productivity, litterfall transfers, rates of litterfall decomposition and observations from avian and aquatic studies.

**METHODS**

**Study Area Infrastructure**

To provide information and organization needed for the multiple studies, closed loop base, perimeter, and transect line surveys have been made. Permanent stakes have been installed at 61 m intervals on all survey lines and where lines crossed streams. Seven transect lines have been located, parallel to each other, at 500 m intervals, as shown in figure one. In the surveys the location and elevation of each stake have been determined. In support of avian study a separate point grid at 250 m x 250 m intervals has been established. The starting point of all surveys has been randomly selected. Two meteorological stations have been established, one in the forested bottom and the other in an adjacent clearcut opening.

Geographic Information System (GIS) coverages of Iatt Creek are provided by the Kisatchie National Forest (KNF). Coverages include soils, topographic, vegetation and land use, roads, land ownership, and aerial photographs. Geographic positioning System (GPS) and elevational surveys have been used to greatly refine the coverages especially location and extent of sloughs, stream channels, and other features within the study area (figure 1).

**Vegetation Dynamics:**

**Study design and installation**--Beginning at a random starting point, 47 ordination plots were established at systematically located points 122 m apart on the seven transect lines. The plots were 0.1 ha (20 x 50 m) and subdivided into 10, 10 m x 10 m subplots to facilitate data collection and analysis.

Overstory and midstory plants within each plot were inventoried, and species and diameter at breast height (dbh) for each stem ≥ 7.6 cm at dbh were recorded for each 0.01 ha subplot. Elevation above sea level of each subplot corner and maximum elevation of the soil surface at the base of each of the above measured trees were determined.

Sapling and low shrub/herbaceous layers were also measured. For the sapling layer the dbh and species of every tree > 2.5 cm and < 7.6 cm dbh were determined. On a subplot basis all trees < 2.5 cm and > 1.4 m in height were counted by species and size class (2.5 to 1 cm and < 1 cm). In measuring the low shrub(< 1.4 m) and herbaceous layer, ten 1 $m^2$ sample plots were randomly located within each 0.1 ha plot. For each sample plot, percent cover by plant species was determined.

**Data summary and analysis**--Initial analysis efforts have focused on the tree layer (> 7.6 cm dbh) composition and species dominance. Basal Area (BA, $m^2$ $plot^{-1}$), density, and importance value for each species. These variables are summarized by species for all trees, for all dominant and codominant trees, and for all intermediate and suppressed trees. Data for each tree species are aggregated into five data sets: the full data set representing all ten subplots of each ordination plot, two non-overlapping 0.04-ha square plots (S1 and S2), and two non-overlapping 0.04-ha rectangular plots (L1 and L2). The S and L subplots are composites of the smaller 0.01 ha subplots initially established as the subdivisions of the 0.1 ha study plot. Data were summarized into total basal areas (BA) and total density by plot and subplot for each species, and into importance values for each species on each plot and subplot. Importance value has been calculated as (species relative BA as proportion of total BA on plot) + (species relative density as proportion of total density on plot) + (species relative frequency as proportion of 10 (or 4) subplots on which the species occurred). Environmental variables for each of these data sets include the elevation, to the nearest 0.1 m, of all the trees as well as of all the plot corners that belong to that data set.

Analysis of this data set is ongoing and a complete discussion of approach is beyond the scope of this paper. For this paper data analyses have been conducted using SAS (SAS Institute Inc., Cary, NC), CANOCO (Ter Braak 1988), and TWINSPAN (Hill 1979). We have used SAS for data manipulations and for hypothesis testing. We have used CANOCO to conduct a detrended correspondence analysis of the species BA values, and TWINSPAN to conduct a two-way analysis of species and plots to produce a hypothesis of plot and species groupings f visual and nonparametric analysis.

**Aboveground Net Primary Productivity**

Annual Net Primary productivity (NPP) per unit area is calculated as the of annual net biomass increment and detritus production or litterfall (

and branch) (Waring and Schlesinger 1985, Binkley and Arthur 1993).

**Sampling design**--Initial cluster analyses indicated that sweetgum (*Liquidambar styraciflua*) and sweetgum-cherrybark oak(*Quercus pagoda*) are the two dominant communities in the bottom, accounting for 70 percent of the 47 ordination plots. From these dominant communities, 10 plots have been randomly selected for estimation of NPP. The tree, sapling and herbaceous vegetation layers have been defined as in the ordination study.

Biomass increment is the increase in plant biomass produced during the measurement period. It is estimated as the annual change in standing woody biomass plus mortality. For the tree layer within each plot, dbhs have been measured annually and height in alternate years beginning in the winter of 95-96. Using published biomass equations aboveground biomass has been estimated for each tree and summed on a per area basis for each year(Schlaegel 1984, Megonigal and others 1997).

Similarly, beginning in 1996 all saplings (trees < 2.5 cm dbh and > 1.4 m tall) have been identified and measured annually (basal diameter and height). Sapling biomass also has been estimated by use of published equations (Williams and McClenahen 1984).

Mortality occurring between measurements is not measured as biomass in the second measurement year. Therefore, the mass of the mortality occurring between measurements is added to the change in living biomass to provide a valid estimate of biomass increment. Adding the biomass of tree(s) that died during the measurement period to the change in aboveground tree biomass, increases the biomass increment of dead tree(s) to zero for the measurement period (Binkley and Arthur 1993).

For measurement of aboveground herbaceous production, within each productivity plot, 10 points were randomly selected and sampled in August, at the peak of standing biomass. All low vegetation was collected from a 1 $m^2$ plot at each sample point. Vegetation was separated into grasses, sedges, broadleaf, current growth of woody perennials (< 1.4 m,) vines, ferns, and other materials. All components, except woody perennials, were clipped at ground level, sorted by categories in the field, and placed in paper bags. For woody perennials, leaves and current year's twig growth were collected. All materials were ovendried at 70° C with mass reported on an ovendried weight basis.

**Litterfall--Annual Detritus Production**

**Fine litterfall**--Litterfall was measured using litter traps, open mesh baskets supported approximately 1.5 m above the ground by poles. Within each 0.1 ha plot, five litter traps were randomly placed. Collections were made monthly. Contents were sorted into leaf tissue, fruits and flowers, bark and fine wood (< 1 cm diameter), and other, ovendried (70° C), and weighed.

**Branchfall**--Five, 50 $m^2$ sub-plots (5 m x 10 m) were randomly located within each of the 10 study plots. Initially, all coarse woody litterfall (wood > 1 cm in diameter) was marked or removed from each sample subplot. Since 1996, coarse litterfall has been collected on a quarterly basis and processed in a manner similar to fine litterfall.

**Interaction of litter species and forest community in decomposition processes**
Litter decomposition and nutrient mineralization reflect the litter composition and micro-environment in which they occur. The objective of this study was to evaluate the influence of litter species and community type on litter decomposition and nutrient mineralization in bottomland hardwood communities. Using the litterbag technique, the mass loss rates of three litter species or species groups were evaluated in both the bottomland hardwood and adjacent loblolly community types. Nutrient analyses are in process.

In this study the litterbag was a flat nylon net bag, 20 cm x 30 cm, Delta (35 lb test), with 1 mm mesh openings. The litterbags were filled with 20 g of the leaf litter, sewn shut, and placed on the surface of the existing forest floor. Bags were secured in place by use of wire pins.

The three litter species were sweetgum, red oak subgenera (*Erythrobalanus,*) and loblolly pine. Litter materials were freshly fallen senescent leaves collected within the study communities and sorted as to species or species group.

Within each community, on each of the five permanent plots, 3 sets of 14 litterbags were randomly placed for each of the three species of litter. At approximately bimonthly intervals over the next 2.5 yrs, collections of 3 litterbags for each species were made from each of the 10 plots. A total of 1260 litterbags were installed and collected.

Collected samples were returned to the laboratory in individual paper bags, cleaned of foreign materials and soil (as practical), ovendried (70° C), and weighed. Because mineral contamination was significant and variable, a subsample was then ashed at 450° C for 4 hrs in a muffle furnace to allow reporting of mass loss on an ash-free basis.

**Avian and aquatic surveys**
Avian surveys were conducted by means of 10 minute point counts at all study area grid points (Hamel and others 1996). Aquatic populations were surveyed by use of standard electro-shocking and net.techniques in the case of fish and hand probing of habitat in the case of fresh water mussels. Results are reported on a per unit effort basis.

## RESULTS AND DISCUSSION
The mature hardwood forest is tall, multisized, and dominated by large diameter sweetgum, cherrybark oak, and water oak (*Quercus nigra* L.). Some 73 species appear in the woody vegetation layers. The age of the co-dominant/dominant trees (mean height 33 m) is 66 to 75 yrs at 0.6 m above soil surface. Basal area averages 35 $m^2$ $ha^{-1}$ with a mean stand density of 462 stems $ha^{-1} \geq 7.6$ cm, 1037 stems $ha^{-1} \geq 2.5$ cm and 1610 stems $ha^{-1} < 2.5$ cm at dbh. Quadratic mean diameter of all trees ≥ 7.6 cm dbh is 30.4 cm with a quadratic mean diameter of 20.5 cm for all trees ≥ 2.5 cm dbh.

**Ordination**
An example of initial ordination analyses is presented in figure 2. The CANOCO and TWINSPAN programs were applied to data on basal area of all trees on a 10 m x 40 m subset of the full vegetation sample plots. The analysis produced a

combined ordination of plots and species to a six level hierarchy. Analysis of the elevations of the plot corners from the groups of plots distinguished in the ordination revealed the very great variability of species occurrence at the Iatt Creek site. Analysis of variance of elevations indicated that significant differences existed among mean elevations of plots at all six levels of the hierarchy ($R^2$ for level 6 = 0.504, where $F_{(15, 452 df)}$ = 30.71, P = 0.0001). However, the differences among means were distinct and ordered in sequence by elevation for only the two highest levels of the hierarchy ($R^2$ for level 2 = 0.326, $F_{(2, 465 df)}$ = 112.44, P = 0.0001). A simultaneous plot of the species and plots indicated the substantial variation among species in the minor stream bottom. Because the variation in elevation within plots is relatively large compared to the variation in elevation across the entire study site, efforts to distinguish gradients defined by elevation will be difficult.

**Litterfall**
Consideration of seasonal litterfall patterns is beyond the scope of this report. Based upon 3 yrs of data, mean total litterfall is 8520 kg $ha^{-1}$ $yr^{-1}$ with leaves accounting for 63 percent, fruiting structures and seeds 15 percent, fine wood 12 percent, and other fines 9 percent. Total fine litterfall is near the upper limit of the litterfall range (1380 - 8550 kg $ha^{-1}$ $yr^{-1}$) reported by Megonigal and others (1997) for an array of southeastern wetland forests. Indeed, the Iatt Creek litterfall is among the highest reported in world forests (Bray and Gorham 1964, Meentemeyer and others 1982, Vogt and others 1986), as a group exceeded only by tropical rainforests.

**Net Primary Productivity**
Initial estimates of aboveground Net Primary Productivity are shown in table 1. Accounting for approximately 60 percent of total NPP, the single dominant component is fine litterfall or leaf production. Wood increment accounts for approximately 28 percent of total NPP with coarse branchfall accounting for 11 percent.

The distribution of productivity reflects the maturity of the forest and the multi-layered nature of the forest vegetation. Due to the mesic conditions, the study area supports a large leaf surface area. The large diameter branchfall reflects natural pruning associated with a mature, closed canopy forest. The 14,000+ kg $ha^{-1}$ $yr^{-1}$ is high but within the range reported for southeastern wetland forests (Megonigal and others 1997). As with litterfall, the NPP of the study area is among the highest for the world's forests outside the tropics. The relationship and responsiveness of annual aboveground NPP to yearly and across site variation in site parameters is being investigated.

**Fine Litterfall Decomposition Rates**
We compared the rates of mass loss for senescent leaf tissue from cherrybark oak, sweetgum and loblolly pine (*Pinus taeda* L.) in the bottomland and adjacent uplands. Changes in mass remaining were fit to the negative exponential model of Jenny and others (1949). Rates of decompositions are reported as "k" values (table 2). In forests, k values commonly range from 0.01 in boreal coniferous to 1 or 1.2 in temperate deciduous forests and as high as 4 to 6 in tropical rainforests.

After 13 months litter in the pine community exhibited lower k values than in the bottomland (table 2). Within both communities the k values for pine litter are lower than for deciduous litter. Moreover, within the pine community, sweetgum mass loss is somewhat greater than red oak while the k values are nearly identical for the two broadleafed species. After 27 months the k values show a lack of significant differences between communities with the primary difference being the much slower rate of decomposition for the pine needles.

The k values (table 2) based on the entire 27 months ranged from 0.44 to 0.78. As expected, mass loss rates for pine needles were significantly lower than deciduous species. The impact of substrate quality differences between pine and deciduous broad leaf species has been frequently noted (Swift and other 1979, Heal and others 1997). Decomposition constants for the broadleaf species are within the range of wetland forests. For forested wetlands, our k values for single deciduous species are lower than the 1.01 reported by Lockaby and Walbridge (1998) and 0.83 of Conner and Day (1991) in a natural forested wetland. However, they are slightly higher than the 0.667 of Day (1982). Regardless of variation, the k values for the dominant deciduous species are indicative of a forest with a high rate of decomposition and nutrient mineralization (Swift and other 1979)

**Wildlife Populations**

**Avian populations--** Repeated winter and summer counts revealed 75+ bird species. Of these species, 23 were Neotropical migrants and 17 were North temperate or short distance migrants. These surveys are continuing.

**Fish and freshwater mussel assessment--**In September of 1997, aquatic biologists from the Center for Bottomland Hardwoods Research quantitatively surveyed the fishes and freshwater mussels at two sites along Iatt Creek mainstem and four sites in the floodplain (e.g., beaver-dammed tributaries, overflow depressions). The two mainstem sites were located at the northern boundary and in the middle section of the study area. The mainstem of Iatt Creek yielded 21 fish species and the shallower flood plain habitats yielded from 6 to 16 total fish species. With few exceptions, the fish fauna found in the isolated pools on the floodplain represented a subset of the fauna in the mainstem. Further analysis of catch-per-unit-effort and relative abundances of fishes may provide additional information on the composition of the fauna between mainstem sites and between mainstem and floodplain sites.

The main stream sites yielded six total freshwater mussel species, but no freshwater mussels were found in the flood plain habitats. Freshwater mussels were most common in the shallow riffles and pools at the mainstem site on the northern boundary where catch per unit effort was 80 mussels/person-hour searched. In the middle section, catch per unit effort was lower (24 mussels per person-hour searched); however, all six freshwater mussel species were present at both mainstem sites.

**ACKNOWLEDGMENT**

We wish to acknowledge the critical assistance of the people of the Kisatchie National Forest and Winn Ranger District, especially Marq Webb, Jim Crooks, Tina Tilley, Frank Yerby, and the Forest Engineering and GIS groups. Finally, we extend our deep gratitude and respect to the technicians of the Center for Bottomland Hardwoods research, especially, Al Brazzel, Kenney Caraway, Keith Willis, Melissa Breland, and Angelia DeLaughter.

**Literature Cited:**


Bailey, R.G. 1998. Ecoregions: The Ecosystem Geography of the Oceans and Continents. New York, NY. Springer. 176 p.

Binkley, D.; Arthur, M. 1993. How to count dead trees. Bulletin of the Ecological Society of America. 74: 15-16.

Bray, J.R.; Gorham, E. 1964. Litter production in forests of the world. Advances in Ecological Research. 2:101-157.

Day, J.W., jr. 1982. Litter decomposition rates in the seasonally flooded Great Dismal Swamp. Ecology. 63: 670-678.

Conner, W.H.; Day, J.W., jr. 1991. Leaf litter decomposition in three Louisiana freshwater forested wetland areas with different flooding regimes. Wetlands. 11: 303-312.

Gardiner, E.S.; Hamel, P.B.; Meier, C.E.; Stanturf, J.A. 1996. Initial ordination of the overstory and midstory vegetation of Iatt Creek floodplain, Louisiana. In: Flynn, K.M. editor. Proceedings of the southern forested wetlands ecology and management conference; 1996 March 25-27; Clemson University, Clemson, SC. Clemson, SC: Consortium for Research on Southern Forested Wetlands, Clemson University: 160-164.

Hamel, P.B.; Wylie, C.B. jr; Fischer, R.A.; Guilfoyle, M.P.; Spengler, T.J.; Wakeley, J.S. 1996. Initial comparison of bird communities of three southern forested wetlands. In: Flynn, K.M. editor. Proceedings of the southern forested wetlands ecology and management conference; 1996 March 25-27; Clemson University, Clemson, SC. Clemson, SC: Consortium for Research on Southern Forested Wetlands, Clemson University: 170-175.

Harms, W.R.; Stanturf, J.A. 1994. Study plan: A quantitative assessment of the structure and functions of forested wetlands in bottomland hardwood ecosystems in the southern United States. Stoneville, MS: USDA Forest Service, Southern Forest Experiment Station, Study Plan FS-S04155-110. 26 pp.

Heal, O.W.; Anderson, J.M.; Swift, M.J. 1997. Plant litter quality and decomposition: An historical overview. In: Cadisch, G; Giller, K.E., editors. Driven by nature: Plant litter quality and decomposition. Cambridge, UK. University Press, CAB International: 3-30.

Hill, M.O. 1979. TWINSPAN. A FORTRAN program for arranging multivariate data in an ordered two-way table by classification of the individuals and attributes. Ithaca, New York: Microcomputer Power.

Hodges, J.D. 1998. Minor alluvial floodplains. In. Messina, M.G.; Conner, W.H. editors. Southern forested wetlands: ecology and management. Boca Raton, FL: Lewis Publishers. Boca Raton, FL, USA. 325-342.

Jenny, H.; Gessel, S.P.; Bingham, T.T. 1949. Comparative study of decomposition rates of organic matter in temperate and tropical regions. Soil Science. 68: 419-432.

Lockaby, B.G.; Walbridge, M.R. 1998. Biogeochemistry. In. Messina, M.G.; Conner, W.H. editors. Southern forested wetlands: ecology and management. Boca Raton, FL: Lewis Publishers: 149-172.

Meentemeyer, V.; Box, E.O.; Thompson, R. 1982. World patterns and amounts of terrestrial plant litter production. BioScience. 32: 125-128.

Megonigal, P.J.; Conner, W.H.; Kroeger, S.; Sharitz, R.R. 1997. Aboveground production in Southeastern floodplain forests. Ecology 78: 370-384.

Owenby, J.R.; Ezell, D.S. 1992. Monthly station normals of temperature, precipitation, and heating and cooling degree days 1961-1990, Louisiana. Climatography of the United States No. 81. Asheville, NC: U.S. Department of Commerce, NOAA, National Climatic Data Center: 22 p.

Schlaegel, B.E. 1984. Sweetgum volume and weight tables. Research Paper SO-204. New Orleans, LA: United States Department of Agriculture, Forest Service, Southern Forest Experiment Station. 14 p.

Swift, M.J.; Heal, O.W.; Anderson, J.M. 1979. Decomposition in Terrestrial Ecosystems. Berkeley, CA: University of California Press. 372 p.

Ter Braak, C.J.F. 1988. CANOCO - A FORTRAN program for canonical community ordination. Ithaca, New York: Microcomputer Power.

Vogt, K.A.; Grier, C.C.; Vogt, D.J. 1986. Production, turnover, and nutrient dynamics of above- and belowground detritus of world forests. Advances in Agronomy 15: 303-377.

Waring, R.H.; Schlesinger, W.H. 1985. Forest ecosystems: concepts and management. Orlando, FL: Academic Press Inc. 340 p.

Williams, R.A.; McClenahen, J.R. 1984. Biomass prediction equations for seedlings, sprouts and saplings of ten central hardwood species. Forest Science. 30: 523-527.

Table 1--Initial estimates of the aboveground net primary productivity for the mature sweetgum cherrybark oak dominated forest of Iatt Creek, LA.

| Component | kg $ha^{-1}$ $yr^{-1}$ |
|---|---|
| Tree Layer Wood Biomass Increment | 3880 |
| Sapling Layer Wood Biomass Increment | 30 |
| Fine Litterfall | 8520 |
| Coarse Branchfall | 1530 |
| Herbaceous Annual Production | 160 |
| Total Aboveground NPP | 14120 |

Table 2-- Jenny k values for two sites and three leaf species, where *percentage remaining* = $e^{-kt}$ (t= time in yr) (Jenny and others 1949).

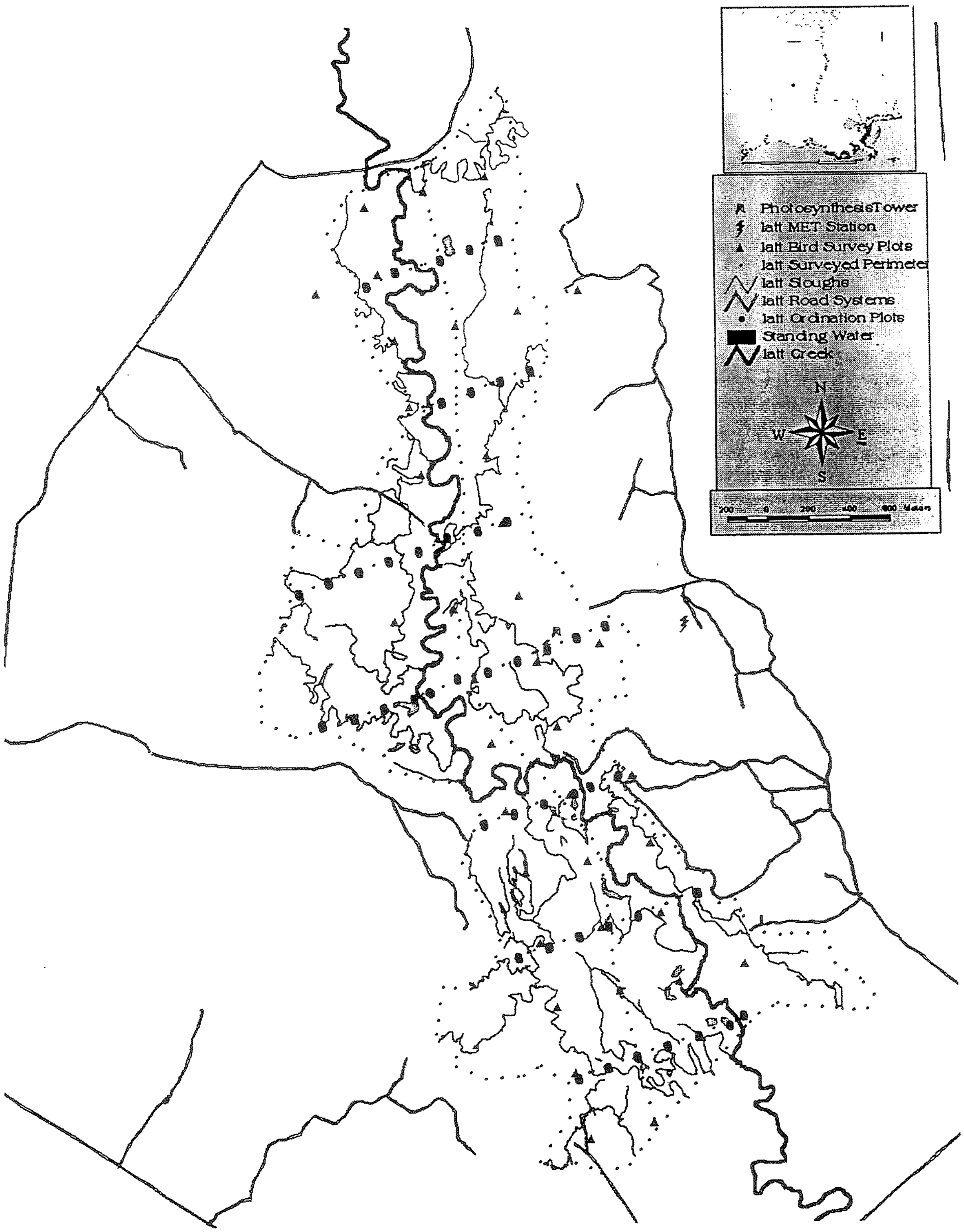
| Leaf Species | Site | |
|---|---|---|
| | Bottomland Hardwoods | Upland Pine |
| | k values based on initial 13 months. | |
| loblolly pine | 0.43 | 0.28 |
| red oak | 0.77 | 0.58 |
| sweetgum | 0.76 | 0.63 |
| | k values based on entire 27 months. | |
| loblolly pine | 0.51 | 0.44 |
| red oak | 0.76 | 0.76 |
| sweetgum | 0.77 | 0.78 |

**FIGURE CAPTIONS**

Figure 1--The Iatt Creek Study Area, Winn Ranger District, Kisatchie National Forest.

Figure 2--Initial Canonical analysis plot of one data subset from the overstory ( > 7.6 cm dbh) vegetation data set of the Iatt Creek Study.

# Iatt Creek


PhotosynthesisTower
Iatt MET Station
Iatt Bird Survey Plots
Iatt Surveyed Perimeter
Iatt Sloughs
Iatt Road Systems
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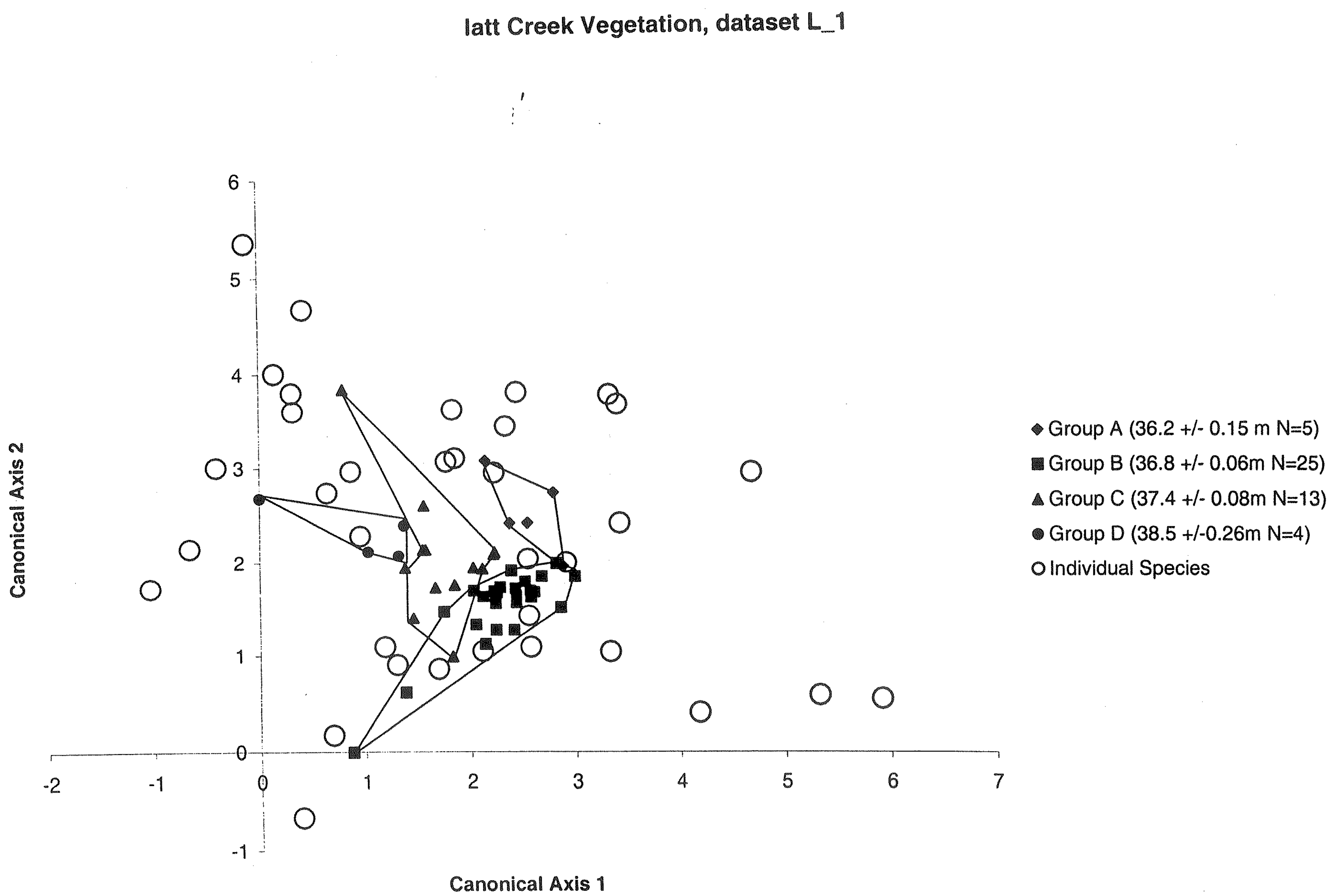

Iatt Creek Vegetation, dataset L_1
Canonical Axis 2
Canonical Axis 1
Group A (36.2 +/- 0.15 m N=5)
Group B (36.8 +/- 0.06m N=25)
Group C (37.4 +/- 0.08m N=13)
Group D (38.5 +/-0.26m N=4)
Individual Species